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EXAMINER
CARTELMO GREGG

ART UNIT
1733

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Please find below and/or attached an Office communication concerning this application or
proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.
08/902,331

Applicant(s)
Gruenenfelder et al.

Examiner
Gregg Cantelmo

Group Art Unit
1753



☐ Responsive to communication(s) filed on _____

☐ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

☒ Claim(s) 34-43 is/are pending in the application.

Of the above, claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 34-43 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☒ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☒ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☒ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been
☐ received.

☒ received in Application No. (Series Code/Serial Number) 08/417,854.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☐ Interview Summary, PTO-413

☒ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

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DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: on page 11, line 9, the term "ES" should be E_s .

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 34 and 37 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

a. Claim 34 teaches of a relationship between the "circular target body radius ... r_1 " and the "amount of taper of the circular target body ... d_0 ." This relationship is quantified by the following: " $0.22 r_1 \leq d_0 \leq 0.38 r_1$ " in line 11. The specification does not teach of such a relationship between the circular target body radius and amount of taper. One skilled in the art at

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the time the invention was made would be required to perform undue experimentation to prepare a target within the given parameters.

b. Claim 37 teaches of a relationship between the circular target body radius and the thickness of the periphery of the target body (d_a). Use of the equation " $d_a \approx 0.5 r_1$ " in line 3, further defines the relationship. The specification fails to teach of a thickness of the periphery of the target body nor of a quantified relationship between the thickness of the target periphery and the radius of the circular target body. One skilled in the art at the time the invention was made would be required to perform undue experimentation to prepare a target within the given parameters.

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 34, and 36-43 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 34 recites the limitations "the periphery" in line 3, "said body" in lines 3, 5, 6, and 9, "the center" in line 3, "the symmetry axis" in line 5, "the back-side" in line 6, "the amount of taper" in line 8, "said axis" in line 9, "the bottom" in line 9, and "the radius" in line 11. There is insufficient antecedent basis for these limitations in the claim.

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Claim 36 recites the limitation "the body" in line 1. There is insufficient antecedent basis for this limitation in the claim. It is suggested that "the body" be changed to the circular target body in order to maintain the integrity of the claimed invention.

Claim 37 recites the limitations "the body" in lines 1-2, and "the thickness" in line 1. There is insufficient antecedent basis for these limitations in the claim.

Claim 38 recites the limitations "the symmetry axis" in line 8, "said opening" in line 9, "the tapered ring segment" in line 23, "the radius" in line 25, "the axial extend" in line 26, and "said tapered ring segment" in lines 26-27. There is insufficient antecedent basis for these limitations in the claim. With respect to the tapered ring segment, the term first should be correctly applied as initially cited in line 4 of the claim.

Claim 40 recites the limitations "said tapered ring segment" in line 2, and "said substantially flat ring segment" in lines 2-3. There is insufficient antecedent basis for these limitations in the claim.

Claim 41 recites the limitation "said tapered ring segment" in line 1. There is insufficient antecedent basis for this limitation in the claim.

Claim 42 recites the limitations "the target body" in line 3, "said target body" in lines 1,3,8, and 9, "its periphery" in line 4, "its center" in line 4, "said receiving ring" in lines 5, 8-9, 12, and 27, "said tapered ring segment" in lines 9-10, 20, and 26-27, "said tapered sputtering surface" in line 9, "the center" in line 10, "the radial extend" in line 20, and "the axial extend" in line 26.. There is insufficient antecedent basis for these limitations in the claim.

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Claim 43 recites the limitations "the surface area" in line 1, "said tapered ring segment" in lines 1-2, "said receiving ring" in line 2, "the surface" in line 3, and "said target body" in line 3. There is insufficient antecedent basis for these limitations in the claim.

6. The term "preferably" in claims 38, 39, and 42 is a relative term which renders the claim indefinite. The term "preferably" is not defined by the claims, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

In claim 38, the term is cited in lines 12, 14, 18, and 20. The specification does not clearly indicate the preferred diameter required for the first ring segment in order the device to function as set forth in the claim.

In claim 39, the term is cited in line 3 when referring to the diameter of the receiving ring. The specification does not clearly indicate the preferred diameter required for the receiving ring in order the device to function as set forth in the claim.

In claim 42, the term is cited in lines 15, 22, and 25 pertaining to the central distance from the target body to the central opening. The specification does not clearly indicate the preferred distance required between the target and the central opening to allow the device to function as set forth in the claim.

Without such teachings in each claim, undue experimentation would be required to prepare the apparatus. In addition, the phrase "preferably" renders the claims in the alternative form and therefore considers to be indefinite.

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7. The term "especially" in claims 42 is a relative term which renders the claim indefinite. The term "especially" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The claim employs the use of the term with respect to the distance between the center of the target body and a plane across the central opening of the receiving ring in line 17, with respect to the radial extend of the tapered ring segment in line 24, and with respect to the axial extend of taper of the tapered ring segment in line 31.

However, the specification does not clearly define the term "especially." When employed to a specified range of parameters, the term especially is should indicate a specific range allowable to be considered under said term to allow the device to function as set forth in the claim. It is suggested that each additional limitation of a specified range be introduced in a subsequent claim and not be contained in the same claim so as to refrain from being ambiguous. Without such teachings undue experimentation would be required to prepare the apparatus.

8. The term "preferred" in claim 42 is a relative term which renders the claim indefinite. The term "preferred" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The term is cited in line 17 of the claim but fails to indicated the specific "preferred range" between the target center and central opening of the receiving ring.

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The term is also cited in line 31 of the claim when referring to the “especially preferred” axial extend of the taper of the tapered ring segment. Use of these indefinite terms renders the specified parameters indefinite for failing to explicitly exclude parameters outside of the specified range. It is suggested that each additional limitation of a specified range be introduced in a subsequent claim and not be contained in the same claim so as to refrain from being ambiguous. Without such teachings undue experimentation would be required to prepare the apparatus.

9. Claims 38 and 42 are objected to because of the following informalities:

a. In claim 38, line 3, use of a hyphen (-) following the term “diameter (ϕ_{13})” renders the claim difficult to interpret. It is recommended that this part of the claim be rewritten. For example, “a central circular opening with a diameter (ϕ_{13}) wherein there exists a first ring segment with a radial width (Δ) and being tapered by an amount (a) that is adjacent to said first opening.

In claim 38, line 17, the claim teaches the following relationship: “ $0.12 r_{13} \leq a \leq r_3$.” The two bold faced items in this relationship require correction. First it is suggested that one of the \leq symbols between 0.12 be removed r_{13} and a be removed, and second that r_3 should be changed to r_{13} .

Also in claim 38 the phrase “wherein there is valid” on line 10 is vague and should be rewritten as follows: wherein the following relationship is valid.

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b. In claim 42, the phrase, “A set of circular target body and of a circular receiving ring...” in lines 1-2, is written in such a way to render the claim indefinite. It is unclear as to whether the “set” is referring to the target alone or of the target and the circular receiving ring. It is suggested that the paragraph should begin as follows: A sputtering apparatus comprising of a circular target body and of a circular receiving ring. Appropriate correction is required.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. Claims 34-37 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. patent No. 4,385,979 (Pierce et al.). Pierce et al. teach of a target that demonstrates the specified target parameters in claims 34-37. In column 11, lines 11-13, the prior art teaches of a target having an outside diameter of 131.0 mm and of a maximum height of 22.4 mm. Using the instant applications claimed mathematical relationship in claim 34, line 11: $0.22 r_1 \leq d_0 \leq 0.38 r_1$ and the diameter of 131.0 mm ($r_1 = 65.5$ mm) d_0 from the prior art, the distance range from the outermost periphery of the target to the bottom of the target can be derived. According to these limitations, the target distance can range from a minimum height or thickness of 14.41 mm to a maximum height or thickness of 24.89 mm. Therefore this relationship is well known to one of

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ordinary skill in the art since the maximum height assigned to the specified radius of the prior art was 22.4 mm. Also the target diameter cited in the prior art in column 11, lines 11-12 (131.0 mm) is within the range specified in claims 35 and 36 of the instant.

With respect to claim 37, and the mathematical relationship " $d_a \approx 0.5 r_1$," one skilled in the art would employ such a relationship as stated above to obtain an optimal thickness. Pierce et al. cite in column 11, line 13 that the maximum height for the target for a diameter of 131.0 mm (65.5 mm radius) is 22.4 mm. Use of the instant applications mathematical relationship and of the prior arts target diameter obtains a target thickness or height of 37.75 mm. When compared to the maximum height proposed in the prior art, the proposed value is less than what is calculated from the mathematical relationship. However, in order to obtain this ideal thickness as the prior art indicates, it is necessary to experiment with thicknesses both substantially larger and smaller than this maximum value. Furthermore, the mathematical relationship states that the thickness of the target is approximately one-half of the radius of the target and does not provide adequate disclosure of a range that would be acceptable for this approximate equivalence. One of ordinary skill in the art would apply the teaching of Pierce et al. to the instant applications claimed invention to provide a maximum sputter yield onto the substrate.

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Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claims 38-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. patent No.5,330,632 (Sichmann). Sichmann is considered to show a similar receiving ring and target which define a process space for sputtering as claimed in the instant application. Figure 1 of this reference shows a tapered and annular receiving ring(9) that is adjacent to the central opening(15). The prior art also teaches of a second ring segment which may be read on either rings 7,8, or 10 of Figure 1. Dotted lines 18 and 19 of Figure 1 define a plasma discharge area. Upon close examination of this region, Sichmann teaches that only a minimal area of the discharge coats the receiving ring. Through this depiction, the degree of taper of the receiving ring is significant in determining the efficiency of target(16b) sputtering. If the taper is too large, there will be an increase in the amount of atoms sputtered onto the receiving ring. If the taper is too small, the ring may not support the workpiece and the anode ring (8) may be coated and need to be replaced (Sichmann: column 2, lines 56-60).

Since the plasma discharge region is defined by both the taper degree and radius of the target surface and the length of the radial and axial extends of the receiving ring are significant

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with respect to the degree of interference with the plasma discharge region, Sichmanns teaching imply that there is a relationship between the target dimensions and the receiving ring dimensions. Application of this relationship will provide for an increased sputtering efficiency where the receiving ring interference with the target defined plasma discharge region is minimal.

The instant application provides a range for the central distance from the target center to a plane across the central opening of the receiving ring. Although Sichmann does not disclose such a teaching it would be obvious to one of ordinary skill in the art to employ such a range as claimed in lines 14-18 of claim 42 of the instant application so as to provide for a maximum surface on the workpiece for the sputtered atoms to adhere to. Figure 1 of Sichmann shows that the glow discharge region, defined by reference characters 18 and 19, extends the full distance of target 16b. Since there is significant force or interference acting upon the region, it would be advantageous to have a receiving ring area of a substantially equivalent distance. Thus the diameter of both the target and receiving ring would be relatively close in size.

Sichmann also teaches that the distance from the center of the target body to a plane across the central opening of the receiving ring is defined by the target diameter and more importantly the receiving ring diameter. In order to provide for an higher degree of sputtering efficiency, the distance from the target center to the central opening must be within a range specified by the receiving ring diameter. If the distance is too great there would be a decrease in the coating thickness on the periphery of the workpiece. If the distance is too small, there would

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be an increase in the coating onto the receiving ring. In either case, the efficiency of the apparatus is compromised.

While Sichmann fails to cite the specified dimensions of the receiving ring nor of the distance between the target surface and the fram, it is obvious to one skilled in the art to apply specified dimensions to the sputtering apparatus of Sichmann because it improves the sputtering efficiency of the apparatus by minimizing the receiving ring interference on the glow discharge region and it improves the ratio of atoms sputtered to atoms deposited onto the workpiece.

Double Patenting

14. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

15. Claims 34-43 rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1-32 of U.S. Patent No. 5,688,381 in view of U.S. patent No. 4,385,979 (Pierce et al.) and U.S. patent No. 5,330,632 (Sichmann). U.S. patent No

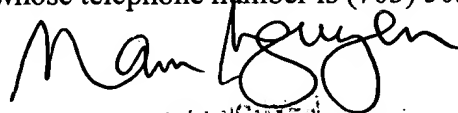
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5,688,381 claims all of the limitations of the instant application except for the specified parameters and configuration of the target and receiving ring. Pierce et al. and Sichmann teach of these limitations as cited and explained in the 102 and 103 rejections of this office action. One skilled in the art at the time the invention was made would further define the parameters of the target and receiving ring of U.S. patent No. 5,688,381 by employing the teachings of Pierce et al. and Sichmann in order to define a cavity where a stable plasma discharge is obtained because, upon operation, one would have an improved ratio of atoms sputtered from the target to atoms deposited on the workpiece and the combination of these elements will provide for a more efficient sputtering apparatus.

Conclusion

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent No. 5,112,467 and German patent No. DE 43 15 023 A1 depict symmetrical annular targets which are tapered along with similar receiving ring structures that together define process spaces for sputtering.

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregg Cantelmo whose telephone number is (703) 305-0653.


NAM NGUYEN
PRIMARY EXAMINER
GROUP 1100

gc

August 25, 1998